Facharbeit

# The Role of AI in Education: How does it influence learning?

Written by

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## 1. Introduction – Why is the role of AI in Education relevant?

The role of AI in Education plays a significant role in discussing the future of education as it is a highly discussed topic at the moment especially after the release of ChatGPT which highlights the importance of it.

I, myself as a student can reflect on my experiences on this matter and research the future of AI more closely since it affects me and my education as it can possibly change the whole education system.

Unleashing a Chatbot named ChatGPT, making it available for everyone including students and teachers impacts education and learning processes in various aspects. In my experience ChatGPT was used to complete school or research work easier and faster. For students, it represents better and faster accessibility to the internet. It can also be used for reading texts in less than seconds and giving you an outline, so you don't have to read the text. The use of AI can be an advantage in some cases and lead to a better learning experience however I have only experienced this once or twice in two years of active use.

For this reason, I have decided to deal with the role of AI in education to expand and broaden my horizon as it is interesting to see how AI might evolve and what challenges and advantages it might bring along. I haven't been able to see the advantages of AI so this paper might change that. Besides that, this topic affects me directly in educational terms but also in private when thinking about the future. While writing about the role of AI in education I am able to educate myself about the topic and gain a deeper understanding.

I am going to start my paper by introducing the background and definition of AI in education and talking about the historical context of it. Hence, when and where was AI introduced into education and where was it used in the past?

After doing so I am going to talk about existing applications of AI in education like learning platforms, virtual tutors, Chatbots, paraphrasing tools etc.

Furthermore, I am going to elaborate on the advantages of AI in the education sector. To exemplify, more efficient teaching and learning processes or improved adaptation to individual learning needs.

Afterward, challenges and concerns will be of topic. Like privacy and ethical considerations, potential impacts on existent teaching methods regulations concerning the use of AI in education as this is of high importance due to the newness of AI.

At Last, I will be looking at future predictions on the development and benefits or fears regarding the future such as improved learning opportunities or fears concerning job losses and over-reliance.

## 2. Background and Definition of AI in Education

### 2.1 Definition of AI

Artificial Intelligence has various definitions that describe the same concept. One definition according to IBM is: “Artificial Intelligence is, or AI, is technology that enables computers and machines to simulate human intelligence and problem-solving capabilities.”. Artificial intelligence is able to do complex tasks with the help of data sets and other information that usually require human intelligence and surveillance. AI uses concepts like machine learning[1] and also deep learning[2] to understand and learn. For instance, AI is able to understand images, texts, software, and much more and is able to learn and process it and act based on the input (“What is Artificial Intelligence (AI)?”).

### 2.2. Historical Context of AI in Education

Since the start of AI in 1943 by the logician Walter Pitts and Neurophysiologist Warren McCulloch AI has evolved slowly and steadily. In 1943 Pitts and McCulloch published the paper “A Logical Calculus of Ideas Immanent in Nervous Activity” in which they explain neural networks and the concept of artificial neurones starting the discussion and idea of Artificial Intelligence (Press,“Celebrating 80 years of hallucinating about Artificial Intelligence “). Moving forward one of the most influential people in the development of AI Alan Turing published the paper “Computing Machinery and Intelligence” and produced the Turing Test to measure a machine’s intelligence. Due to the high expenses of a computer, Alan Turing was not able to put his words into action. Therefore, a conference hosted by John McCarthy and Marvin Minsky in 1956 called the Dartmouth Summer Research Project on Artificial Intelligence which included various researchers and experts on the topic came up with the Logic Theorist, was a great step towards the development of AI (Anyoha, “The history of Artificial Intelligence”). There are many more steps regarding the full evolution of AI but the focus on education allows us only to look at the most important milestones regarding the advancement on the education sector. A great step towards improving education was in 1966 when the first chatbot ELIZA

[1] Machine Learning is computer science that uses data and algorithms to mimic the human learning process

[2] Deep Learning is a form of Artificial Intelligence that uses human-like neural networks to process data and information

was created that used the so-called natural language processing (NLP)[3] to talk to humans. This was the first step that would evolve in the concept of Deep Learning which is now the basis of Generative AI[4]. In the following years a period called the AI Winter which was highlighted by more research, but lacking support AI continued to evolve in human-like reasoning and decision-making which finally helped to build adaptive tutoring and an understanding towards tasks. From the 1990s AI finally was implemented into programs such as chess-playing systems (1997) or speech recognition softwares (1997). At the start of the 2000s the first robot to mimic human behaviour and emotions helped in advancing the cognitive science[5] of AI. Other inventions like the NLP computer Watson by IBM which was programmed for question-answering (2011) or the implementation of virtual assistants also contributed to the progress of AI. The further use of Artificial Intelligence since 2012 led to Deep Learning breakthroughs and advances in NLP which resulted in improved educational softwares. In the last years OpenAI was one of the main contributors to the development of AI in education with programmes like DALL-E, ChatGPT or Sora it is now able to help students understand and complete tasks ("What is the history of Artificial Intelligence (AI)?").

# 3. Existing Applications of AI in Education

## 3.1. Examples of successful global implementations

Using AI in education has been a subject for the past 40 years. Since the start of AI in 1956 by John McCarthy it has evolved and around the 1980s advanced rapidly due to innovative technologies at that time such as computers, smartphones, or social media. Intelligent tutoring systems were invented in the 1960s, however at that point it has not evolved into something that helps students actively and provides tutoring for them but in 2014 helped to teach illiterate students to learn to read and write, especially in developing countries. To achieve this in roughly half of a century required a progress of speech recognition to ensure a stable communication between tutor and student. Nevertheless, AI still has a problem with teaching students that are fully literate due to the lack of communication and teachable content (Russel, p.64). At current times virtual assistants like Siri from Apple or Alexa from Amazon or Generative AI such as Chatbots are used the most. According to the interviews of my fellow students the navigation system or speed camera detectors or even robot waiters are good examples for global implementations of AI. It is also very interesting to see how concepts like Deep Learning or Natural Language Processing were able to evolve and result in programs

[3] The concept of Natural Language Processing is responsible for understanding and mimicking the human language for instance to support student learning.

[4] Generative AI is able to create new images, texts or music based on the input the user provides.

[5] Cognitive Science is a wider form of study which includes various complex concepts like philosophy or neuroscience with which AI can mimic human thought and action.

which revolutionized the education sector. According to the university of San Diego AI plays a great role in their education system. AI does jobs like transcribing faculty lectures or helps in academic research and much more. Specific programs like “Thinkster Math” which creates personalized learning sets for students and can act as a teacher or “Cram101” which creates questions or flashcards and a guided study on the basis of a textbook are also mentioned by the CEO. The University also claims that AI can enhance inclusion and universal access to education. For example, through transcribing lessons it can be translated by AI and can also be helpful to students with poor hearing or vision. So, the goal is to address every student, regardless their background, disabilities or location and ensure that everyone has equal opportunities regarding education (“43 examples of Artificial Intelligence in Education”).

## 3.2. Examples of applications of AI in my surroundings by fellow students and teachers

In the interviews that I have done with my fellow students and teachers I asked about their most used AI programs used in their role as teacher or student or in their private life. Most of them used ChatGPT which is arguably the best and most accessible Chatbot and first to be released on a global scale. Until OpenAI’s release there was nothing comparable to its success or level. ChatGPT is the most used in the classroom and basically is there for doing every task if it is for academic purposes or even in the private life such as ideas of what to do in their free time or quick and easy food recipes. In some cases, it can also act as a friend and can help you find a solution for a dilemma that you are involved in. According to my interview it is sometimes also used for that and really helps with providing good advice. The famous chatbot is not only used for good purposes but mostly for completing homework or other assignments at last minute. Its high accessibility for students and fast working on basis of lengthy texts makes it just more convenient for students. This is also a common problem in the academic system at the moment. Teachers are already prepared for the usage of ChatGPT in schools and also recognise AI in some work of students as I have experienced lots of times. Teachers also use ChatGPT in their work as a teacher to create examples to be discussed in class or as help for time consuming activities which makes it easier for teachers to prepare their lessons without looking for sample tasks on the internet or spend too much time on thinking of it.

Not only ChatGPT is an example of AI used by my fellow students or teachers. Programs like Quillbot or GPTZero which are paraphrasing tools that are mostly used on texts written by AI so teachers won’t recognise the use of AI. In some cases, these types of tools also help to bring variant vocab into your text so it is not so monotonous. Furthermore, Hesse AI is also used quite frequently according to my interview. Hesse AI is an AI which writes lengthy papers like this one for you. You just have to type in the structure and citation style and then it generates a paper for you. The disadvantage for teachers here is that most of the AI detectors

do not recognise AI based content which makes it harder for teachers to differentiate between work that the student really has done and which of it is AI based. Additionally there is Tome AI which I also have tried once. Tome is a tool which can create a PowerPoint presentation on the user's input. When I tried to do it the problem I faced was that the presentation was filled with too much text. When I prepare a PowerPoint presentation for class then I pay attention to my use of texts and I mostly use bullet points so it is easier for the audience to read the presentation and still focus to what the presenter says. For creating images, the AI most used by me and my fellow students was Bing AI. Bing AI is an extension of Microsoft's browser. Although the chatbot uses DALL-E for creating images which is one of OpenAI's best AI run programmes. I have used this AI exclusively for image creation in various subjects. In an arts project for example or in English when creating an Instagram feed based on a story. Other than that programmes like Grammarly or DeepL for translating or checking texts for mistakes are also used by my teachers, friends and me. In the process of writing my paper I also used Citation Machine for citing works without manually typing every citation in but just pasting a link or book title and can copy and paste it into my bibliography. In addition to that there are also programs that provide personalised feedback such as Fiete AI. It was used once in class, and I must say I made a good experience with it. You have access to the task and sources the teacher provides on the website and you can write your solution in a text box and Fiete continues to give you feedback and tells you which part you can improve. In further interviews other tools like Ghost AI or Goat AI which are other examples of Generative AI were mentioned. Although after interviewing teachers or students ChatGPT is just always mentioned. If it is for freshing up your memory on difficult concepts or finishing homework. There are several reasons that other AI tools are not used as frequently. For instance, most of those websites need you to register and create an account which is annoying according to many students. Other programs such as a Hesse AI only offer a certain amount of words and you need to pay money to unlock more words. This is also an advantage ChatGPT offers as it has an endless amount of words whether the input or the output. Even with ChatGPT many problems were mentioned in the interviews such as the problem of understanding the task or that ChatGPT is sometimes too off topic and can't comprehend some concepts which makes it hard to use it for math as an example. In worst cases it can even misguide students by providing false information on topics due to its limit of knowledge to everything since 2021. Another interesting experience of AI that I came to know was when I interviewed a pastor and asked him how he used AI in his work when teaching children. He used it for creating quiz question which is a similar to the use of teachers.

## 3.3. What did AI advance in the education sector?

As mentioned before AI improved education in many ways. To conclude it improves assistance in several ways and can explain or summarise or generate ideas for students and teachers.

This process of assistance is also accelerated with the help of AI. Immediate access is now available and offers answers or advice right away. Also as mentioned before AI makes individualisation for different learning needs and provides access from every country as it can translate materials easily. It also helps giving personalised feedback by analysing data sets and could replace tutors one day ("5 pros and cons of AI in the education sector").

# 4. Challenges and Concerns of AI used in Education

## 4.1. Privacy and Ethical Considerations

There are a lot of concerns regarding the use of AI in education as there has not been enough experience of the ethical and privacy field. Due to the new technology many experts are divided on this topic as some see AI as the downfall of humans and others see new opportunities which were never possible. Also there has been a regulatory action called the European Union's AI Act in 2023 which provides AI developers in Europe certain obligations and specific requirements. Currently experts on cybersecurity are hired to work on an improved data security system (Nguyen, p.89).

### 4.1.1. The BIAS Problem of AI

The risk of bias in AI is widely spread among the AI community. When programming AI it is trained with data which could be biased that result in an algorithmic bias which influences the output level of that specific AI tool. Those biased or prejudiced outcomes can lead to misguidance of students using Artificial Intelligence. For instance, when Elizabeth Spiers asked Duet which Google Lab's generative AI was asked to create an image of "a very serious person" and the created image was a picture of "a bespectacled, scowling white man who looked uncannily like Senator Chuck Grassley." ("I Finally Figured Out Who ChatGPT Reminds Me Of"). When Google Translate was asked to translate the Turkish gender-neutral "nurse" into English it automatically translated it into the feminine form or when asked to translate the Turkish gender- neutral "doctor" into the masculine form. As there are several AI-based facial recognition systems that also showcase similar bias problems. Such systems have falsely identified mostly African American and Latino American people as convicted felons (Akgun & Greenhow, "Artificial intelligence in education: Addressing ethical challenges in K-12 settings"). This shows that AI is trained on a data set that contains social biases or gender-specific stereotypes. There are much more AI-based platforms where gender or racial biases are noticed. In education it is important to teach students that heritage, race, sexuality, gender or physical and mental disabilities does not determine anything about a person and teachers are thought not to take this into consideration when grading a student. However, when AI is asked about sensitive topics the bias of the AI is shown and if AI tutors or teachers would be integrated in the education sector this could result in a serious problem. Students and teachers

should be taught how to deal with this issue and should be able to question AI-generated work. Regarding this matter several training courses have been offered to teachers but students are still not educated enough on this topic.

### 4.1.2. Privacy Concerns

While using Artificial Intelligence it continuously collects data regarding the user's race, language spoken, identity, biographical data and location which raises privacy issues and concerns for many people. AI has access to face and voice recognition and can understand and keep track of certain phrases or facial expressions from the user. AI also remembers what kind of apps the user uses most or to what kind of places they go to. It even sees what kind of messages users get and how long they look at certain messages and what they do after to put it into context and note information about every user's behaviour. With the help of all this information it can see the bigger picture and sell data to corporations (Russel, pp.104/105). Furthermore, AI can use all this information for controlling purposes such as blackmail in extreme cases. When implementing AI into education collecting this data may be essential in some cases. Exemplary to solve the problem of growing chronic absenteeism which means that students are missing school for no good reasons research has shown that regular alerts to the parents when the student misses lessons or fails tests helps to improve this problem. Many staff members of schools need to place calls which could last up to an hour so teachers or school staff only inform parents when it reaches an extreme to where the students are about to fail every class. If they would do that for every student that missed school once or failed once this would require too much time. For this problem AI offers great help by automatically sending an alert to parents as soon as the student misses a class or fails a test and at first sight this would seem like a great advantage. However, when taking a closer look the AI-based program requires access to every student's personal data such as family and parents, location, attendance records and grades. With this approach students are forced to share their personal information with AI as AI needs good data sets to provide accurate results, the better the data the better the outcome. In China there even are some schools which require students to wear so-called biofeedback headbands which track who is focused on the class and who is not. This information is sent to teachers. When putting this and brain imaging that can produce accurate text data from brainwaves together this could invade students' mental security and raises questions about the freedom of thought (Buck, "Ai is a serious threat to student privacy"). There are many more examples of invasion of students' privacy through AI which are understandable as AI needs information to be implemented successfully. This is a dilemma many educators have faced for the last years and have tried to solve by applying the right regulations on the use of AI and securing students' data. What the right regulations and security measures are still of question.

### 4.1.3. Over-dependence on AI

Implementing AI systems in education can lead to an overreliance on such systems. For instance, many of my fellow students have become over reliant on ChatGPT as they have been working with it for the past year and done assignments with it. The confrontation with ChatGPT has become a regular occurrence in my life as a student due to everyone in the classroom using it. The over-dependence of students on AI is of concern due to a potential stultification and a lack of knowledge and understanding particularly in the "four C's of 21st century skills" which are critical thinking, creativity, collaboration and communication. Students are tempted to use AI which is much faster and sometimes also better than investing their own time and effort into task solving (Bailey, "Ai in Education"). The same applies to teachers although in most cases teachers use AI only efficiently. I only once experienced a teacher using ChatGPT for questionable purposes which is not comparable to the students' situation at the time. Also when educational institutions implement AI into their system they rely much more on the internet than before and if they were hacked it could paralyse the whole institution and in serious cases lead to a data breach which provides hackers with access to students' personal information.

## 4.2 Regulations on the use of AI in education

As slightly mentioned before there have been regulatory actions towards the use of AI in education, some of which I will name now. Although since the topic is so new and unexplored this was not easy for many governments and also the education sector. According to a UNESCO[6] global survey of around 450 schools only 10% of them were equipped with guidelines or regulations regarding the use of AI in their education system which was mostly due to the lack of national regulations. Besides that, many schools underestimated Generative AI greatly and did not approach the problem with the needed checks or restrictions. According to UNESCO the publication of new textbooks got more attention than this topic (O'Hagan, "UNESCO: Governments must quickly regulate generative AI in schools").

### 4.2.1 Examples of Regulations globally implemented

Most existing regulations are highlighted by principles such as transparency, privacy, fairness and responsibility (Nguyen). Exemplary the UNESCO guidelines focuses on various aspects regarding this topic. UNESCO highlights the need for regulations and policies. Also AI developers should respect human rights such as data safety. AI-based programs should be under human surveillance to prevent biased algorithms and should be transparent (UNESCO, "Artificial Intelligence in education"). AI should promise accessibility and equal

[6] UNESCO is the short form of "United Nations Educational Scientific and Cultural Organization" which promotes education, science and culture. UNESCO is a special organisation from the United Nations.

opportunities regardless the country. Everyone should be able to take advantage of its innovation and knowledge. The privacy of humans is the most important to preserve and mass surveillance should be prevented at all costs. UNESCO's main goal is to align their goals with those of AI by suggesting ethical and practical steps (Rajaratnam, "UNESCO's guidance for Generative AI in Education and research"). In addition to that the European Union have also acted on this topic and published "The General Data Protection" (GDPR) which makes AI-based programs only able to access students' personal data when they have a lawful basis. Every individual should decide on their GDPR rights and should decide whether their data can be used to train the AI (Lappenküper, "Ethical and privacy issues when using AI Tools"). Not only that but the European Union are also responsible for the "AI Act" which is the first to be seen legal framework on AI. The EU provided a risk-based approach and defined 4 levels of risk for AI systems: minimal risk, limited risk, high risk and unacceptable risk. The goal is to avoid unacceptable uses of AI which are defined by the EU. Also to apply restrictions and obligations for high-risk AI applications and their developers. Every new AI system requires a conformity assessment before being released into the public to establish a governance structure in the EU. The main goal here is similar to UNESCO's mission namely to respect fundamental rights, ensuring human safety and global alignment on AI governance ("AI Act", European Commission).

## 4.3. Potential Impacts on Existing Teaching Methods

Since AI has been integrated more and more into educational systems it not only brings advantages to the table but also several disadvantages or impacts on existing teaching methods. As slightly touched on before students are much more able to access AI at current times than ever before. From my personal experience AI is mostly used for doing homework or even cheating on exams which influences former existing teaching methods greatly and forced teachers to change their student-approach. Due to this the earlier mentioned "four C's of 21st century skills" are much harder to be taught. AI could trigger the isolation of students. The school system promotes collaboration among students so they can learn to work in groups with everyone to improve students' social skills. Although when a student gets used to AI then the risk of losing motivation and discipline increases by a considerable amount which can lead to higher dropout rates in the worst cases ("5 pros and cons of AI in the education sector"). To solve these kind of issues teachers need to change their teaching methods and make them more attractive to students. However traditional teaching methods have already been of concern due to students' growing social media use or other factors like recent pandemics or wars. As many traditional teaching methods have turned out be ineffective and show a need for change anyway, AI is just another big factor regarding this problem.

# 5. Future Outlook of AI in education

## 5.1. How could AI improve education in the future and how can it be used in a useful and effective manner?

As mentioned in the last sections AI can also be used efficiently and effectively on educational levels. But how can AI impact education in the future and how can it be implemented usefully? Many experts have been clashing on this subject as various aspects speak for but also against it. Sal Khan the founder of the Khan Academy also talked about how AI could revolutionise the education sector in his Ted Talk. The Khan Academy is an online platform where children from around the world can access education. It provides learning videos and various other resources for students. Sal Khan presents a Graph in his Ted Talk and talks about how AI could revolutionise the education sector in the future. The problem he introduces is called the "2 Sigma Problem" (cf. exhibit 1, appendix) which shows a study that highlights the impact of one-on-one tutoring on a student. It can turn a below average student to an exceptional one. The CEO of the Khan Academy also explains how his platform offers one-on-one tutoring through an AI bot which is programmed to help students and understand misconceptions to resolve them and teach the student how to think the right way. The conversation is also accessible to the teacher so they can view the learning progress and make sure the student does not misuse AI. This tool can also serve as a guidance counsellor or even as therapist. A new technique to develop AI was also presented by Khan. Developers are able to make the AI think first and then give the answer which greatly improved the outputs of the tool and also opts for improved tutoring (Khan, "How Ai Could Save (Not Destroy) Education: Sal Khan: Ted.").

*"One opportunity I see with AI is being able to reduce the amount of attention I have to give to administrative things and increase the amount of attention I can give to my students with their learning needs in the classroom. So that's the first one that I'd say that I'm super excited about the possibility of AI to support me as a teacher."*

—Vidula Plante[7] ("Artificial Intelligence and the future of teaching and learning")

This quote from Vidula Plante shows that AI could be the opportunity for an improved student-teacher approach and shifts the focus on administrative tasks to teaching and interacting more with students in the future to improve their learning experience and help every individual with improving their skills. As shown in exhibit 2 (cf. appendix) only half of the teacher's time is

[7] Vidula Plante is a science teacher from the Manchester Essex Middle School

spent on active student-teacher interactions the other half mostly involves administrative work and activities. The teacher who is quoted explains that AI could take over the administrative work so the teacher has more time and attention for students. As already mentioned earlier when talking about privacy concerns this is a great opportunity but involves ethical considerations as AI needs access to students' data which could violate their safety.

## 5.2. Fears regarding the Future of AI in Education

There are lots of predictions regarding the future of Artificial Intelligence in education due to the ambivalent state concerning the topic. Some experts say that AI will take over humans and could be seriously dangerous in the future. On the contrary others as mentioned before are astonished by its existence and ability to learn from humans in a way which only benefits us.

### 5.2.1. Fear of Job Losses

The fear concerning loss of jobs is widely spread among the workforce currently. As just mentioned above many jobs in the administrative sector can be replaced by AI and work more efficient than human beings due to the lower error rate. Although AI is still far from human reasoning. According to recent studies 37% of all businesses say AI has already replaced several jobs in 2023 and 44% of them are of the opinion that there will definitely be layoffs in 2024. Besides that, many workers also are convinced that one-third of their tasks can be easily replaced by AI (Curry, "Recent data shows AI job losses are rising, but the numbers don't tell the full story"). However, in the education sector there are many different views regarding these issues. Exemplary there are many examples of humanoid robots[8] around the world. Such as for example the humanoid robot "Iris" from Kerala, India was introduced a few weeks ago into a school in India and apparently understands several languages and was programmed specifically for students meaning it consists of many filters regarding sensitive topics like for example drug use or racism. ("India: Kerala introduces its first humanoid robot teacher: Latest english news: Wion"). Although the use of humanoid robots in education is not widespread at all and this is one of few examples. Furthermore, the fear of job losses in the education sector is not as widespread as in other service sectors due to their important role in educating students. Students will still rely on a human teacher who is available to them in every situation and serve as mentor or supporter. This is something most teachers as well as experts agree on (Talmage-Rostron, "How Will Artificial Intelligence Affect Jobs 2024-2030"). Although there still is a possibility for humans and AI-based robots to work together in the future and cooperate on education.

[8] Humanoid robots are advanced robots which mimic human beings' interactions', their appearance and their behavioural patterns.

### 5.2.2. Fears regarding Privacy, Ethics and Over-Reliance. Can humans get ‘dumber’?

There are lots of fears concerning privacy and ethics when talking about the usage of AI in education as already explained above in challenges and concerns. Issues like data misuse and over-reliance on AI which might result in stultification. The growing data demand is a concern for lots of experts as it is a serious invasion into students’ privacy.

When we are not educated enough on the limitations of AI we can get over reliant there are predictions and concerns of humans getting ‘dumber’ over time (Granados, “Human borgs: How artificial intelligence can kill creativity and make us dumber”). Exemplary, more and more work gets laid off to AI in educational settings and the learning experience will become more and more ineffective over time which results in less-educated people. As education already worsened in certain factors like student attention or focus on exams when compared to the past and is still declining AI would just accelerate the process and for example gradually increase the lack of students paying attention (Al-Rabbat,” Is education better today than in the past?”).

## 5.3. How does ChatGPT view the future of AI?

After reviewing several predictions of the future, negative as well as positive, I thought of asking ChatGPT about its view towards the future of AI in education The tool that I used was Copilot which is also known as Bing AI that is also based on ChatGPT. The question I asked was very open since AI uses the input when formulating the output so when I tried using a more specific question the answer was very similar to the question and not a complex answer to my question. I also needed to mention my intention which was to do an interview because otherwise it would give me a summary of key points from the internet. The question I settled on was: “How do you view the future of AI in education? I need to do an interview with you so can you shortly present your opinion?”. The answer is shown in exhibit 3 (cf. appendix). When looking at the beginning of the answer Copilot clearly states that it is not able to have opinions or feelings this could be a beforehand measure from the developers or really means that AI cannot have feelings or opinions. Striking about this answer is that it is just a mere summary of everything mentioned in this paper so it gave me a summary of the existing information regarding the topic I asked about. So this specific AI is not able to share an opinion about the future of AI in education with us and can only reproduce and summarise data and information on the internet or provided by the user. Whether other AI tools are able to answer this question is not probable due to the similarities between every tool but there might be new tools that are able to but are restricted to developers only for testing.

# 6. Conclusion of Results

## 6.1. Summary of key findings

There are lots of advantages as well as disadvantages regarding AI in education. AI evolved steadily since the 1940s and improved its learning ability throughout the years thanks to concepts like deep learning and machine learning. There were many people involved in the development of Artificial Intelligence such as Alan Turing or John McCarthy. The goal was to develop something that imitates human thinking and learning which was fulfilled to some extent although AI is not able to assess dilemmas like humans do with their morals or ethics. This aspect is particularly important since it ensures the reliance on humans as teachers. However, there are many applications of AI in the education sector like for example as virtual tutors, teaching assistants or administrative coordinators. AI ensures equality, in terms of offering equal chances of education around the world, assistance, personalization and speed. Those aspects are also implemented successfully on a global scale and actively improve the sector. Besides that, AI brings many challenges and concerns about security purpose, surveillance issues or the fear of over-reliance. Regarding this concern many measures or regulation have been placed on the use of AI in education. On one hand AI could be the downfall of humans as we could get over-reliant on it or we could risk our personal privacy. On the other hand AI could revolutionize the education sector positively.

## 6.2. Personal View

After analysing the role of AI in education very closely in aspect I could broaden my horizon and educate myself on the topic which was my original aim. At the beginning of the paper I was sceptical about AI due to my experiences with the way it was put to use in my surrounding which was mainly handing off tasks. Although after taking a closer look at the advantages, further concerns and the future of AI in education my view has slightly changed towards it. I think AI can surely be implemented in a useful manner that benefits students' learning experience and can turn below-average students into above-average students. However, teachers as well as students need to be educated first and should know the advantages and limitations of Artificial Intelligence. In my opinion there should be clear regulations regarding the use of AI so an over-dependence is highly unlikely. Even though AI offers several benefits there are still issues like invasion of privacy, surveillance and over-dependence which surely needs to be put into consideration when implementing AI into education.

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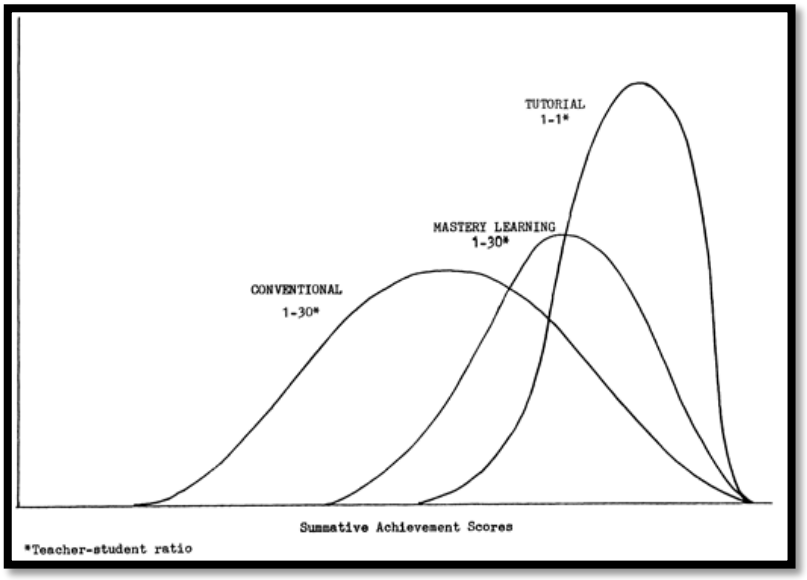
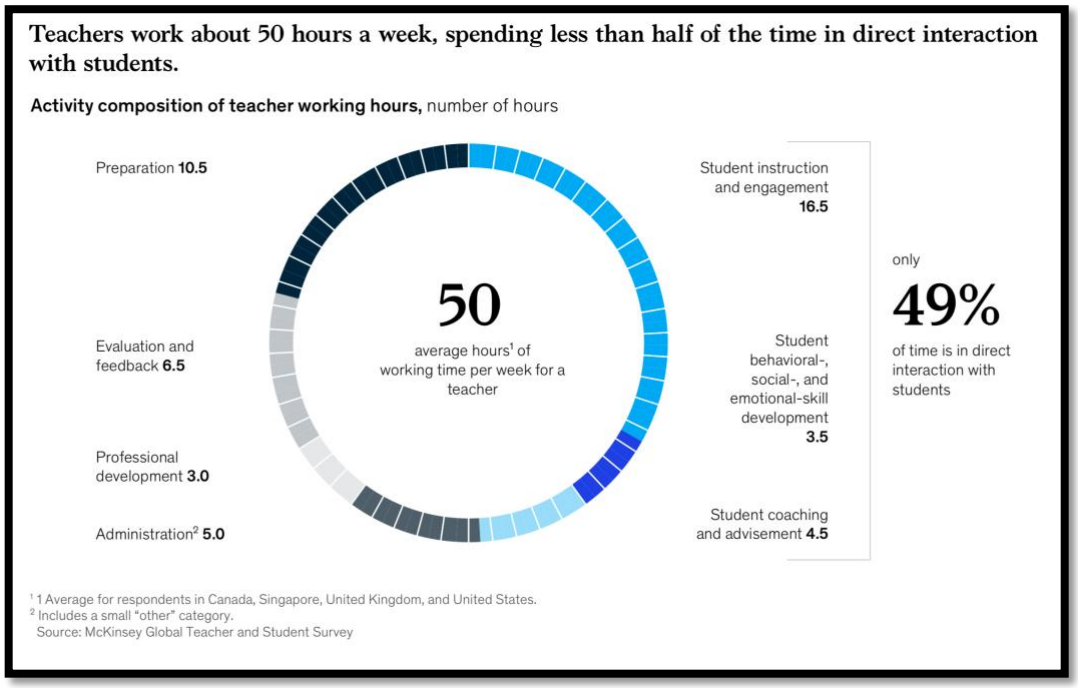
# Appendix

Exhibit 1:




(Benjamin Bloom, “2 Sigma Problem”)

Exhibit 2:




(Bryant et al. How artificial intelligence will impact K–12 teachers)

Exhibit 3:

As an AI language model, I don't have personal opinions or feelings. Let me share my perspective on the future of **AI in education**:

1. **Customized Learning Paths**: AI can adapt to individual student needs, providing personalized learning experiences. It tailors content, pace, and assessments to optimize understanding and engagement.
2. **Automated Grading and Feedback**: AI can efficiently grade assignments, freeing up educators' time. It also offers instant feedback, helping students learn from mistakes promptly.
3. **Data-Driven Insights**: AI analyzes student performance data, identifying patterns and areas for improvement. Educators can use these insights to refine teaching strategies and interventions.
4. **Virtual Tutors and Assistants**: AI-powered chatbots and virtual tutors can answer student queries, provide explanations, and offer guidance 24/7. They complement human educators and enhance learning experiences.
5. **Ethical Considerations**: As we integrate AI, we must address ethical concerns. Transparency, bias mitigation, and data privacy are critical areas to navigate.

In summary, AI has transformative potential in education, but responsible implementation is essential.

(Answer to interview question, Copilot AI)